

# CLAIMS

What is claimed is:

1. A method for joining at least two work pieces (13, 14) by friction stir welding using a rotating tool (10) with a pin-like projection (11); comprising the steps of:

placing said at least two work pieces (13, 14) on top of one another such that the areas to be joined are disposed adjacent one another, moving said rotating tool 10 onto the uppermost work piece (13) in the area where the work pieces are to be joined such that said pin-like projection (11) engages said work pieces and, while being pressed against said work piece, generates friction heat to at least plasticize the material of said work piece (13), moving said rotating tool (10) axially toward the lowermost work piece through the material being plasticized up to the top surface of the lowermost work piece (14) and then removing said rotating tool (10).

2. A method according to claim 1, wherein an alloyed joint is formed between the work pieces by the plasticized materials which were intermixed during the friction stir welding.

3. A method according to claim 1, wherein oxides are removed from the surfaces of the work pieces as the pin-like projection (11) frictionally engages the surfaces of the work pieces.

4. A method according to claim 1, wherein the tool (10) with the pin-like projection (11) is moved along the joint area.

5. A method according to claim 1, wherein pressure is applied to the material while being plasticized.

6. A method according to claim 5, wherein the pressure is applied by a shoulder (12) of the tool (10) around the pin-like projection (11).

7. A method according to claim 1, wherein the work pieces (13, 14) are joined also in a form-locking manner.

8. A method according to claim 7, wherein said work pieces (13, 14) are joined in a form-locking manner by the introduction of plasticized material into cavities (16) formed into the lower work piece (14).

9. An apparatus for joining at least two work pieces (13, 14) by friction stir welding, which work pieces (13, 14) are disposed closely adjacent each other in the area in which they are to be joined, said apparatus comprising:

a rotatable shaft (10) having a free end with a pin-like projection (11), which, for stir welding, is brought into contact with the area in which the work pieces (13, 14) are to be joined for plasticizing the joint area, said pin-like projection being movable along its axis of rotation through the material of the work pieces, while plasticizing the work piece materials by friction heat until the pin-like projection (11) reaches the surface of the lowermost work piece (14).

10. An apparatus according to claim 9, wherein the length of said projection (11) corresponds essentially to the thickness of the work piece or work pieces on top of the lowermost work piece (14).

11. An apparatus according to claim 9, wherein said pin-like projection (11) is disposed on a shoulder (12) of said rotatable shaft (10).

12. An apparatus according to claim 19, wherein at least one of said shoulder (12) and said pin-like projection (11) is provided with a wear layer.